

Chapter 7

Quality Assurance

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[Editors note: During 2004, responsibility for the environmental Quality Assurance (QA) program was divided among three groups—the Environmental Monitoring Laboratory (EML), the Environmental Monitoring and Analysis group (EMA), and the Geochemical Monitoring group (GM)].

SRS's environmental QA program is conducted to verify the integrity of data generated by onsite and subcontracted environmental laboratories.

The program's objectives are to ensure that samples are representative of the surrounding environment and that analytical results are accurate.

This chapter summarizes the 2004 QA program. Guidelines and applicable standards for the program are referenced in appendix A, "Applicable Guidelines, Standards, and Regulations."

Tables containing the 2004 QA data and the nonradiological detection limits can be found on the CD accompanying this report.

A more complete description of the QA program can be found in *Savannah River Site Environmental Monitoring Program* (WSRC-3Q1-2, Section 1100) and in the *Savannah River Site Environmental Monitoring Section Quality Assurance Plan* (WSRC-3Q1-2, Section 8000).

The 2004 QA data and program reviews demonstrate that the data in this annual report are reliable and meet applicable standards.

QA for EMA Laboratories

Internal Quality Assurance Program

Field Sampling Group

EMA and EML personnel routinely conduct a blind sample program for field measurements of pH to assess the quality and reliability of field data measurements.

EMA personnel also measure total residual chlorine, dissolved oxygen, and temperature in water samples; but because of the difficulties in providing field standards, these measurements are not suitable for a blind sample program.

During 2004, blind pH field measurements were taken for 24 samples. All field pH measurements except one outlier were within the U.S. Environmental Protection Agency's (EPA's) suggested acceptable control limit of ± 0.4 pH units of the true (known) value. The pH meter for the outlier has been recalibrated and tested to ensure that it will produce accurate pH data.

Chemistry and Counting Laboratories

Blind Tritium Samples Blind tritium samples provide a continuous assessment of laboratory sample preparation and counting. During 2004, 10 blind samples were analyzed for tritium; all the results were within the control limits.

Laboratory Certification EML is certified by the South Carolina Department of Health and Environmental Control (SCDHEC) Office of Laboratory Certification for the following analytes:

- under the Clean Water Act (CWA) – chemical oxygen demand, total suspended solids, field pH, total residual chlorine, temperature, and 26 metals
- under the Resource Conservation and Recovery Act (RCRA) – 50 volatile organic compounds (VOCs) and 27 metals

External Quality Assurance Program

In 2004, EML participated in the U.S. Department of Energy (DOE) Quality Assurance Program (QAP), an interlaboratory comparison program that tracks performance accuracy and tests the quality of environmental data reported to DOE by its contractors.

For a radiological laboratory intercomparison in 2004, the analysis of 42 isotopes was completed in March on the 60th set of QAP samples. A performance rating of 100-percent acceptable was achieved on the 60th set. This rating was calculated by dividing the “acceptables” and the “acceptable with warnings” by the total number of results. Environmental QA personnel consider 80 percent to be the minimum acceptance rating in this program.

Detailed QAP intercomparison study results can be found in the data tables section of the CD accompanying this report.

QA for Subcontracted Laboratories/EMA Laboratories

Subcontracted environmental laboratories providing analytical services must have a documented QA program and meet the quality requirements defined in the *WSRC Quality Assurance Manual* (WSRC 1Q).

An annual Department of Energy Consolidated Audit Program evaluation of each subcontracted laboratory is performed to ensure that all the laboratories maintain technical competence and follow the required QA programs. Each evaluation includes an examination of laboratory performance with regard to sample receipt, instrument calibration, analytical procedures, data verification, data reports, records management, nonconformance and corrective actions, and preventive maintenance. Reports of the findings and recommendations are provided to each laboratory, and follow-up evaluations are conducted as necessary.

Nonradiological Liquid Effluents

Effluent samples are analyzed by three onsite laboratories and one subcontracted laboratory. Laboratories must be certified by SCDHEC for all National Pollutant Discharge Elimination System (NPDES) analyses.

Interlaboratory Program

During 2004, EMA- and GM-subcontracted laboratories participated in the Environmental Resource Associates (ERA) WatR™ Pollution Proficiency Testing (PT) Studies, which include various InterlaB WatR™ Supply Water Pollution (WP) Performance Evaluation Programs.

EPA uses PT results to certify laboratories for specific analyses. As part of the recertification process, EPA requires that subcontracted laboratories investigate the outside-acceptance-limit results and implement corrective actions as appropriate.

General Engineering Laboratory (GEL), participated in the WP 114 study and reported acceptable results for 218 of 222 parameters; Lionville Laboratory, participated in the WP 108 study and reported acceptable results for 219 of 223 parameters; Severn Trent Laboratory (STL), St Louis, participated in the WP 114 study and reported acceptable results for 158 of 179 parameters.

Laboratories (commercial and government) that analyze NPDES samples participate in the Discharge Monitoring Report–Quality Assurance (DMR–QA) study or the WP study. Under this program, the laboratories obtain test samples from ERA. This provider, as required by EPA, is accredited by the National Institute of Standards and Technology. For the 2004 DMR–QA study, Shealy Environmental Services, Inc. (SES) participated in the WP 113 and 115 studies, and EMA, Environmental Bioassay Laboratory (EBL), and the WSRC Site Utilities Division (SUD) participated in the WP 113 study.

SES reported acceptable results for 12 of 13 NPDES parameters; EMA reported acceptable results for one of one parameter; EBL reported acceptable results for 11 of 11 parameters; and SUD reported acceptable results for three of three parameters.

The initial zinc concentration reported by SES was found to be “not acceptable” by the limits published by ERA for WP 113. The most probable cause for this failure was a high bias by the instrument. As a corrective action, SES analyzed zinc from WP 115. This result passed.

Intralaboratory Program

The environmental monitoring intralaboratory program also reviews laboratory performance by analyzing duplicate and blind samples throughout the year.

SES, EBL, and EMA combined analyzed a total of 94 duplicate samples during 2004. Zero-difference results were reported for 49 of these samples. Percent-difference calculations showed that three of the 94 duplicate samples analyzed were outside ± 20 percent of the relative difference.

SES, EML, and EMA combined analyzed a total of 99 blind samples during 2004. Zero-difference results were reported for 53 of these samples. Percent-difference calculations showed that 12 of the 99 blind samples analyzed were outside ± 20 percent of the relative difference.

Results for the duplicate and blind sampling programs met expectations, with no indications of consistent

problems in the laboratories. In some cases, the exceptions might be related to analytical variances, sample contamination, or sampling techniques.

Stream and River Water Quality

SRS's water quality program requires checks of 10 percent of the samples to verify analytical results. Duplicate grab samples from SRS streams and the Savannah River were analyzed by SES and EMA in 2004. Most results were within the \pm acceptance limits. Detailed stream and Savannah River water quality duplicate sample results can be found in the data tables section of the CD accompanying this report.

Groundwater

Groundwater analyses at SRS are performed by subcontracted laboratories. During 2004, Severn Trent Laboratories, Inc., Eberline Services Oak Ridge Lab, and Lionville Laboratory, Inc., were the primary subcontractors. MicroSeeps, Inc., was subcontracted to perform special analyses. In addition to the subcontracted laboratories, the SRS Environmental Bioassay Laboratory performed analytical analyses on site.

Internal QA

During 2004, approximately five percent of the samples collected (radiological and nonradiological) for the RCRA and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) programs were submitted to the primary laboratory for analysis as blind duplicates and to a different laboratory

as a QA check. The laboratories' results were evaluated on the basis of the percentage within an acceptable concentration range.

Generally, results for all QA evaluations were found to be within control limits in 2004. Full results for all QA evaluations can be obtained by contacting the EMA manager at 803-952-6931.

External QA

During 2004, Soil and Groundwater Closure Projects (SGCP) discontinued the use of its internal performance evaluation program and began participation in the Mixed-Analyte Performance Evaluation Program (MAPEP). The Radiological and Environmental Sciences Laboratory (RESL), under the direction of DOE-HQ Environmental Safety and Health (ES&H), administers the MAPEP.

MAPEP samples include water, soil, air filter, and vegetation matrices with environmentally important stable inorganic, organic, and radioactive constituents.

Results from the laboratories for the MAPEP-04-MaS12 Soil Standard and the MAPEP-04-GrW12 and MAPEP-04-MaW12 Water Standards are summarized in table 7-1. The results show that all the laboratories exceeded the expected 80-percent-acceptable-results level for both the soils and groundwater standards.

Soil/Sediment

Environmental investigations of soils and sediments, primarily for RCRA/CERCLA units, are performed by subcontracted laboratories. Data from 2004 were

Table 7-1 Subcontract-Laboratory Performance on Mixed-Analyte Performance Evaluation Program (MAPEP)

Laboratory	MAPEP-04-GrW12 (Water Std)	MAPEP-04-MaW12 (Water Std)	MAPEP-04-MaS12 (Soil Std)
General Engineering	100%	97% ^a	88% ^{b, c}
Severn Trent	100%	100%	94% ^d
Lionville	100%	100%	94% ^e
Eberline	100%	97% ^f	87% ^g

^a Results for uranium-233/234 were not acceptable.

^b Results for technetium-99 and uranium-238 were acceptable with warning.

^c Results for antimony, uranium-233/234, and uranium-238 were not acceptable.

^d Results for antimony, plutonium-239/240, strontium-90, and uranium-233/234 were not acceptable.

^e Results for iron-55 were not acceptable.

^f Results for technetium-99 were not acceptable, and results for uranium-238 were acceptable with warning.

^g Results for antimony and dieldrin were not acceptable.

validated by SGCP according to EPA standards for analytical data quality, unless specified otherwise by site customers.

The environmental validation program is based on two EPA guidance documents, *Guidance for the Data Quality Objectives Process for Superfund* (EPA-540-R-93-071) and *Data Quality Objectives Process for Hazardous Waste Sites (G-4HW)* (EPA-600/R-00-007). These documents identify QA issues to be addressed, but they do not formulate a procedure for how to evaluate these inputs, nor do they propose pass/fail criteria to apply to data and documents. Hence, the validation program necessarily contains elements from—and is influenced by—several other sources, including

- *Guidance on Environmental Data Verification and Data Validation (QA/G-8)*, EPA-240/R-02/004
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-99/008
- *USEPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review*, EPA-540/R-02/003
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540/R-01/008
- *Test Methods for Evaluating Solid Waste*, EPA, November 1986, SW-846, Third Edition
- *DOE Quality Systems for Analytical Services*, Revision 1, April 2004

Relative-percent difference for the soil/sediment program is calculated for field duplicates and laboratory duplicates. Generally, results for all QA evaluations were found to be within control limits in 2004. A summary of this information is presented in each project report prepared by SGCP personnel.

Data Review

The QA program's detailed data review for groundwater and soil/sediment analyses is described in WSRC-3Q1-2, Section 1100.

In 2004, the major QA issues discovered and addressed in connection with these programs for soil/sediment and groundwater analyses included the following:

- Observed calibration instability in soils volatile analyses due to the standard preservative requirement and revised preservation protocol for a single Appendix IX compound required by SCDHEC
- Inconsistent reporting of results (primarily MDLs) from labs
- Uncertified analytes reported without flagging
- Samples exceeding both technical holding and regulatory reporting times due to mismatches with acceptance criteria
- Problems with validation packages submitted by labs
- Various data reporting issues for all laboratories as new contract requirements and electronic EDD formats were introduced

Previously identified items that are still being addressed include the following:

- Data recording problems (cooler number and temperature, field measurements, collection date/times, legible corrections) on chains-of-custody by field samplers
- Inability to demonstrate the absence of spectral interference for liquid-scintillation counter radioisotopes at one subcontracted laboratory
- Inconsistent application of the laboratory portion of the qualification policy from all laboratories due to a newly implemented qualification policy

These findings illustrate that, although laboratory procedures are well defined, analytical data quality does benefit from technical scrutiny. A corrective action plan has been put into place to address these issues, which are expected to be resolved during 2005.